STANDARD FORM NO. 64

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Office Memorandum • UNITED STATES GOVERNMENT

TO : The Files, Project RD-91 [redacted] **DATE:** 7 October 1955 25X1

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FROM : [redacted] 25X1

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SUBJECT: Trip and Progress Report of 3 and 4 October 1955.

1. The writer visited the [redacted] 25X1
Pa., on 3 and 4 October 1955 to view the progress of the [redacted] 25X1
[redacted] Those persons contacted were: 25X1

[redacted] 25X1

2. On Monday, 3 October, a discussion was held concerning the requirements for test equipment. It was resolved that this matter breaks into two general catagories, even though a considerable overlap of function exists. The first problem is one of providing an over-all system check which is capable of calibrating the azimuth indicators, and the second problem is to provide for internal testing of the various amplifier circuits.

3. It was agreed that for the present, the thoughts and opinions concerning the use and application of test equipment would be restricted to informal discussions, with a written recommendation at a later date based on a series of proposed tests. It was felt that the antennas would first have to be constructed and tested for their free space patterns in quadrature, and then simulating some of the conditions of the ultimate installation before any realistic conceptions of system test equipment could be formulated. Several ideas were presented for consideration, one of which involves locating a wide band noise source (buzzer) at predetermined locations on the vehicle for near field checks. The problem of far field checks was discussed, but the writer was unable to give a decision on the matter and must further discuss this problem with the ultimate users of this equipment within the Agency.

4. Internal tests of amplifiers and other component boards were discussed and a number of test equipment parameters were brought out. It was pointed out that the overall gain of an individual channel within a given band must be matched and made equal to the

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gain of the other three channels before any overall system check could be relied upon. Mr. [redacted] pointed out that each channel will have a gain control to provide the necessary correction, but as yet, no signal source or test meter has been decided on. The raw noise generated by the crystal was suggested as a possible basis of a comparison check, but the writer questioned the point that noise generated can be used as a means of measuring the merit of conversion gain. [redacted] agreed to explore this matter before any further exploitation of crystal noise as a signal source is made. Individual component board testing methods to locate possible faults was also discussed. As each of the circuit groups such as pre-amplifiers, pulse stretchers, and audio amplifiers will be on printed boards, test points will be provided that will make it possible to check not only the performance of the entire board, but individual circuits within each board. However, it remains to be determined within the Agency, the extent of test facilities desired before any final determination of test equipment can be made.

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5. A tour of the laboratory revealed that the circuit work on the 750 kc. and on the 4 mc. pre-amplifier is complete, leaving only the fabrication to be accomplished. Each of these preamps consist of three direct coupled SB transistors, and associated resistors; an overall gain of at least 50 db for an output of 1 mw.; and a dynamic range of from -50 db to about -20 db before overloading, but with an instantaneous recovery from a heavy overload. The accomplishment of the 12 mc preamp is more of a problem, as the upper limit currently reached is approximately 10.5 mcs. Mr. [redacted] felt that the full 12 mcs bandwidth would be realized within about two weeks. Of interest, is the indication that the new L5118 transistor now being developed would be the means of relieving this problem as these units have an fmax cut-off of at least 150 mcs. However, none are available, and even if engineering samples could be obtained for testing, [redacted] feels that they would not be available in sufficient quantities for inclusion in the delivered equipment; therefore, the work must procede with selected SB100 units, the L5108.

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6. Work on the other circuits within the console has not yet been started except for the 600 volt supply for the CRT's. An experimental unit viewed consisted of a junction transistor in a 10 kc oscillator driving a Minneapolis-Honeywell 5 watt power transistor which in turn feeds a transformer. A minimum of 3 watts of power at 600 volts is required, but to date a maximum of ~~2~~ 2.2 watts has been obtained. [redacted] has presented the problem to [redacted] a New York concern, who claim they have bench tested a 600 volt transistor power supply which would be suitable for this application, and that they [redacted] will use the U-A unit rather than their own if delivery schedules can be met.

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7. No particular problem is expected from any of the other circuits such as the pulse stretchers and narrow band audio amplifiers, with the possible exception of the combining amplifier which will take the output of each of the 4 channels and combine them for single track presentation to a tape recorder. The possible source of trouble here is due to the reverse gain characteristics of transistors, which in this case, would permit information contained in one channel to be injected into another channel causing an effect of cross modulation.

8. Some of the questions that came out of the various discussions are concerned with the anticipated length of time during which the system would be in operation on batteries only, without being floated across the chargers. Such a condition could occur when the vessel is tied up dock-side with dead engines, or when operating at sea with engines at idle. The power drain upon the batteries is less of a concern than the possible requirement of automatic recorders (photographic) and other equipment as pulse analyzers. The writer made the assumption that A.C. mains power would be available at all times when auxiliary equipment was in operation, and that "dead engine" operation would not exceed 20 hours. Thus, if 100% safety factor is applied, battery size could be obtained. But the writer further stated that a firm determination would be obtained regarding this matter.

9. Another problem concerned the type of information that would be presented to a tape recorder. The determination of PRF only would require the use of a much simpler amplifier than if it is desired to obtain pulse width in addition to PRF. This determination of tape recorder presentation is to be obtained and furnished to [redacted] at an early date. 25X1

10. On Tuesday, 4 October, the writer, together with Mr [redacted] 25X1
and Mr. [redacted] at that company's 25X1
No. 2 plant. This plant is also their radiation laboratory and
is located northeast of [redacted] 25X1
[redacted] 25X1

11. Here certain rather interesting facts quickly came to light, the most startling is that [redacted] does no microwave antenna 25X1
fabrication of their own. They do all of the design work and the testing, but the actual assembly is "farmed out." All horns, for instance, are done by an outfit on Long Island, New York; while helixes are built by a local machine shop. Even so, this does not appear to hamper the work performed, as delivery schedules are quite good.

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12. It was early established that no horns have been built, but that the drawings have been delivered to the New York shop and that the antennas should be forthcoming in the near future. At present, it is the intention of [redacted] to have one only within each band - 6 through 9 - built and tested before ordering more. This fact answered the writer's questions as to the source of the information indicating the deficiencies of the [redacted] horns, which it seems, was derived from the polar pattern diagrams originally delivered to [redacted] as part of the antenna information, and not from any actual measurements. 25X1 25X1 25X1

13. A tour of the lab facilities revealed that considerable work has been done with a particular spiral helix antenna design, which, by the way, is an [redacted] invention. Certain of these helix antennas could well be substituted for horns within the "L," "S," and possibly the "X" bands (1 to 5 kmc), as they seem to show an excellent, uniform pattern characteristic over the design spectrum, and further are circularly polarized. However, it is not known what the relative gain characteristics are when compared to the [redacted] horns. In light of the indicated deficiencies of the [redacted] horns which show beam widths under 60 deg. in some instances, and widths over 100 deg. in other conditions, the writer requested that a certain amount of work be accomplished on the helix and that a direct comparison be made between a helix and a horn in the 1 to 5 kmc region. The results of such a test would then serve as the basis for antenna selection. 25X1 25X1

14. To date, experiments have been unable to obtain beam-widths in excess of 70 deg. for the helix, but of considerable interest is the fact that over a frequency ratio of 2.5 to 1, the beam width will not vary by more than 5 deg., and further, that the relative gain is essentially constant. The major activity anticipated is in the low frequency region from 50 mcs to 160 mcs, as no one has yet invented an efficient, small antenna which gives good results over a wide range at these frequencies.

15. The [redacted] people have set a meeting of 13 October, at which time they expect to establish some tentative cut-off dates for pure experimentation. It is hoped that improved antenna design can be accomplished within this, as yet unknown, period, as it was generally agreed that: 25X1

a. The [redacted] horns aren't too good. [redacted] ILLEGIB 25X1

b. Efficient discones for 50 mcs are too big.

[redacted] will advise as to the results of this meeting. 25X1

16. Later, and back at the [redacted] plant, the writer had a recap of the problems with the [redacted] people and agreed that a meeting would be in order not later than the last week of October. The writer left this group to visit the group working on RD-71, which is the subject of another report. 25X1 25X1

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